

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

BEM1034 –MATHEMATICS FOR ECONOMICS

(All sections / Groups)

31 MAY 2016
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **4 pages** including cover page with **4 Questions** only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.

Question 1 (12 marks)

- (a) Find the value of x for the following equation

$$\log(6x - 2) = \log(8x - 10)$$

[2 marks]

- (b) Solve the system by using the method of **reduction**.

$$\begin{aligned}x + y - z &= 7 \\2x - 3y - 2z &= 4 \\x - y - 5z &= 23\end{aligned}$$

[5 marks]

- (c) A very simple economy consists of **three** sectors coal, steel, and railroads with the *Leontief matrix*

$$A = \begin{bmatrix} \frac{1}{10} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{10} & \frac{1}{10} & \frac{1}{3} \\ \frac{1}{10} & \frac{1}{10} & \frac{1}{10} \end{bmatrix}$$

Determine the production levels needed to satisfy and external demand for **300** units of coal, **200** units of steel, and **500** units of railroad service.

(Useful information: $X = (I - A)^{-1}D$)

[5 marks]

Question 2 (12 marks)

- (a) Find the limit

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 - 3x + 2}$$

[2 marks]

- (b) Using the definition of **continuity**, show that the function is continuous at $x = 5$.

$$f(x) = \frac{x - 5}{x^2 + 2}$$

[2 marks]

Continued...

- (c) Find the **point elasticity** of the demand equation

$$p = \frac{3000}{q}$$

at $q=300$. Then determine whether the demand is **elastic, inelastic or unit elasticity**. Hint: Given the point elasticity of demand is

$$\eta = \frac{\frac{p}{q}}{\frac{dp}{dq}}$$

[4 marks]

- (d) Given an equation $y = (x + 1)^2(x - 2)(x^2 + 3)$. Rewrite the equation in the form of **natural logarithm** and find the derivative of y .

[4 marks]

Question 3 (13 marks)

- (a) Find the integral by **integration by parts**:

$$\int x e^{-x} dx$$

[4 marks]

- (b) Suppose a Cobb-Douglas production function is given by

$$P = \frac{kl}{3k + 5l}$$

- Determine the **marginal productivity functions** ($\frac{\partial P}{\partial k}$ and $\frac{\partial P}{\partial l}$).
- Show that when $k = l$, the marginal productivities **sum** ($\frac{\partial P}{\partial k} + \frac{\partial P}{\partial l}$) to $1/8$.

[4 marks]

- (c) Suppose the **demand** and **supply** functions for a product are given by

$$\begin{aligned} p &= 22 - 0.8q && \text{- demand function} \\ p &= 6 + 1.2q && \text{- supply function} \end{aligned}$$

Find the **equilibrium point** and determine the **consumers' and producers' surplus** under market equilibrium.

[5 marks]

Continued...

Question 4 (13 marks)

- (a) Suppose that a monopolist's marginal-revenue function is given by the **separable** differential equation

$$\frac{dr}{dq} = (50 - 4q)e^{-\frac{r}{5}}$$

Find the **demand equation**, p for the monopolist's product knowing that the revenue $r = pq$ and when $q = 0$, $r = 0$.

[5 marks]

- (b) Solve the **linear** equation

$$\frac{dy}{dx} + 4y - e^{-x} = 0, \quad y(0) = \frac{4}{3}$$

[4 marks]

- (c) Test the following equation for **exactness** and find the solution if it is **exact**.

$$(ye^{xy} - 1/y)dx + (xe^{xy} + x/y^2)dy = 0$$

[4 marks]

End of Page